SOLID-STATE ELECTRONICS

AN INTERNATIONAL JOURNAL

List of Contents and Author Index
Volume 35, 1992

PERGAMON PRESS

OXFORD · NEW YORK · SEOUL · TOKYO

SOLID-STATE ELECTRONICS

EDITORS

DR W. CRAWFORD DUNLAP (Editor-in-Chief)
126 Prince Street, West Newton, MA 02165, U.S.A., Fax: 617-244-1037

R. W. BRANDER
High Trees, Bucklesham Road, Foxall, Ipswich, Suffolk IP10 0AA, U.K.

DR F. M. KLAASSEN
Philips Research Laboratories, Eindhoven, The Netherlands

HONORARY EDITORIAL ADVISORY BOARD

R. H. BUBE, *Stanford, CA*
C. BULUCEA, *Santa Clara, CA*
U. BÜRKER, *Munich*
T. Y. CHIU, *Holmdel, NJ*
L. F. EASTMAN, *Ithaca, NY*
D. K. FERRY, *Tempe, AZ*
J. G. FOSSUM, *Gainesville, FL*
S. K. GHANDHI, *Troy, NY*
G. I. HADDAD, *Ann Arbor, MI*
R. HECKINGBOTTOM, *Ipswich*
H. K. HENISCH, *University Park, PA*
A. C. IPRI, *Princeton, NJ*
A. K. JONSCHER, *Egham Hill*
R. W. KNEPPER, *East Fishkill, NY*
A. G. MILNES, *Pittsburgh, PA*
B. R. NAG, *Calcutta*
H. C. NATHANSON, *Pittsburgh, PA*
A. NUSSBAUM, *Minneapolis, MN*
W. G. OLDHAM, *Berkeley, CA*
J. I. PANKOVE, *Boulder, CO*
J. E. PARROTT, *Cardiff*
R. F. PIERRET, *W. Lafayette, IN*
G. J. REES, *Sheffield*
B. RIDLEY, *Colchester*
H. ROTH, *Hanscom, MA*
D. J. ROULSTON, *Waterloo, Ont.*
C. A. T. SALAMA, *Toronto, Ont.*
R. STRATTON, *Dallas, TX*
R. VAN OVERSTRAETEN, *Leuven*
C. J. VARKER, *Scottsdale, AZ*
C.-Y. WU, *Hsinchu, R.O.C.*

Publishing Office
Pergamon Press Ltd, Pergamon House, Bampfylde Street, Exeter EX1 2AH, England
(*Tel.* Exeter (0392) 51558; *Fax* (0392) 425370).

Subscription and Advertising Offices
North America: Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.
Rest of the World: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, England
(*Tel.* Oxford (0865) 794141).

Subscription Rates
Annual institutional subscription rate (1993): £558.00 (US$1060.00). Sterling prices are definitive. U.S. dollar prices are quoted for convenience only, and are subject to exchange rate fluctuation. Prices include postage and insurance and are subject to change without notice.

Back Issues
Back issues of all previously published volumes, in both hard copy and on microform are available direct from Pergamon Press offices.

Published monthly. Copyright © 1992 Pergamon Press Ltd

Second class postage paid at RAHWAY NJ. Postmaster send address corrections to Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

LIST OF CONTENTS

NUMBER 1

T. C. Lu and J. B. Kuo: An analytical pull-up transient model for a BiCMOS inverter 1

M. J. Deen and Z. X. Yan: A simple propagation delay model for BiCMOS driver circuits 9

J. J. Liou and H. Shakouri: Collector signal delay time and collector transit time of HBTs including velocity overshoot 15

J. H. Zhao, P. F. Tang and J. Jeong: Compositional dependence of Schottky barrier heights of Au on MBE grown $GaAs_{1-x}Sb_x$ 21

A. T. Wu, S. W. Lee, T. Y. Chan and V. Murali: Temperature and field dependence of carrier mobility in MOSFETs with reoxidized nitrided oxide gate dielectrics 27

Hongchin Lin, Neil Goldsman and I. D. Mayergoyz: An efficient deterministic solution of the space-dependent Boltzmann transport equation for silicon 33

S. Huber and W. Harth: Low-frequency open-circuit noise voltage of GaAs pin-avalanche transit-time diodes 43

A. Afzali-Kushaa and M. El Nokali: Modeling subthreshold capacitances of MOS transistors 45

H. S. Hajghassem, W. D. Brown and J. G. Williams: Modeling the effects of neutron irradiation on LEDs 51

G. B. Gao, M. S. Ünlü, J. Chen, B. Mazhari, K. Adomi, G. X. Liu, Z. F. Fan and H. Morkoç: Double-layer collector for heterojunction bipolar transistors 57

Andrzej Wolkenberg, Tomasz Przesławski and Jerzy Klamka: Measurement of the resistance of metal–semiconductor–metal structures using the geometrical magneto-resistance technique 61

M. P. Houng, Y. H. Wang, H. H. Chen and C. C. Pan: The negative differential resistance behavior of GaAs delta-doped structures 67

J. A. Lopez-Villanueva, J. A. Jimenez-Tejada, P. Cartujo, J. Bausells and J. E. Carceller: A high-frequency bidirectional capacitance method to study the evolution of the interface state density generated at low temperatures 73

X. Letartre and D. Stievenard: Electrical behaviour of a sheet of defects 83

Takaya Miyano, Manabu Fujito, Masahiro Kato and Hiroyuki Tsuge: A mechanism for impact ionization of Si n-channel MOSFETs 89

Z. J. Ma, Z. H. Liu, P. T. Lai, S. Fleischer and Y. C. Cheng: Impact of nitridation/reoxidation on performance degradation in n-MOSFETs under Fowler–Nordheim injection 95

E. E. CLARKE, F. N. TROFIMENKOFF and J. W. HASLETT: High-temperature silicon diode models 103

Note
HAOSHENG ZHOU and D. L. PULFREY: Computation of transit and signal delay times for the collector depletion region of GaAs-based HBTs 113

SOFTWARE SURVEY SECTION I

NUMBER 2

WEN-SHIUNG LOUR, WEN-CHAU LIU and YEONG-HER WANG: Investigation of heterostructure-confinement–emitter transistors 117

D. B. M. KLAASSEN, J. W. SLOTBOOM and H. C. DE GRAAFF: Unified apparent bandgap narrowing in n- and p-type silicon 125

T. J. BORDELON, X.-L. WANG, C. M. MAZIAR and A. F. TASCH: Accounting for bandstructure effects in the hydrodynamic model: a first-order approach for silicon device simulation 131

THIERRY OUISSE, SORIN CRISTOLOVEANU and GÉRARD BOREL: Influence of series resistances and interface coupling on the transconductance of fully-depleted silicon-on-insulator MOSFETs 141

L. HE and W. A. ANDERSON: A study of defects induced in GaAs by plasma etching.. 151

M. PORGES and T. LALINSKY: Characterization of planar ohmic contacts—the effect of position of probes on contact area 157

HOUNG-CHI WEI, YEONG-HER WANG and MAU-PHON HOUNG: Effects of base–emitter junction on the resonant tunneling bipolar transistor with double barriers in the emitter 159

A. HINTZ and K. SCHÜNEMANN: Improved balance equations for modeling non-stationary transport and the electron distribution function in GaAs 165

X. H. FU and J. N. CHEN: A point-by-point multiple-sweep numerical algorithm for dopant profiling based on C–V data 181

QIN HUANG, GEHAN A. J. AMARATUNGA and WILLIAM I. MILNE: MOS controlled current interruption 187

A. D. SADOVNIKOV and A. V. TCHERNYAEV: Two-dimensional model of impurity diffusion in polysilicon–silicon structures 193

TERRY S. MA and WAYNE B. GRABOWSKI: Junction breakdown analysis of a floating field-limiting ring structure using a PISCES-2B device simulator 201

XIUMIAO ZHANG: Determination of the profile of the bulk generation lifetime from pulsed MOS-C transients 207

T. JOHANSSON, K. JARL and M. WILLANDER: Power amplifier for ultra high frequency using conventional silicon NMOS IC technology 213

Notes

A. M. IBRAHIM and MAGDY M. IBRAHIM: Modelling of velocity overshoot in submicron semiconductor devices 221

BOGDAN MAJKUSIAK and ANDRZEJ JAKUBOWSKI: A technical formula for determining the insulator capacitance in a MOS structure 223

P. CHAKRABARTI, TANMAY KUMAR, ARUN KUMAR and B. R. NARASIMHA PRASAD: Numerical simulation for estimating C–V characteristics of MODFETs under illumination 225

LÁSZLÓ DÓZSA: A new method to measure fast defect transients in semiconductor and/or insulator samples 228

Announcements I

SOFTWARE SURVEY SECTION: GIGA, SOLID, PRISM, LUMINOUS and OPTIC2 III

NUMBER 3

SOLID-STATE DEVICE AND MATERIAL MEASUREMENTS

ROBERT F. PIERRET and DIETER K. SCHRODER: Foreword v

I. MEASUREMENTS UTILIZING AN OPTICAL PROBE/OPTICAL EXCITATION

Invited Papers

V. A. BURROWS: Internal reflection infrared spectroscopy for chemical analysis of surfaces and thin films 231

R. K. AHRENKIEL: Measurement of minority-carrier lifetime by time-resolved photoluminescence 239

M. L. LOVEJOY, M. R. MELLOCH, R. K. AHRENKIEL and M. S. LUNDSTROM: Measurement considerations for zero-field time-of-flight studies of minority carrier diffusion in III–V semiconductors 251

E. YABLONOVITCH and T. J. GMITTER: A contactless minority lifetime probe of heterostructures, surfaces, interfaces and bulk wafers 261

Regular Papers

S. C. CHOO, L. S. TAN and K. B. QUEK: Theory of the photovoltage at semiconductor surfaces and its application to diffusion length measurements 269

J. BARBOLLA, S. DUEÑAS and L. BAILÓN: Admittance spectroscopy in junctions 285

V. GRIVICKAS, J. LINNROS, A. VIGELIS, J. ŠEČKUS and J. A. TELLEFSEN: A study of carrier lifetime in silicon by laser-induced absorption: a perpendicular geometry measurement 299

F. SANII, F. P. GILES, R. J. SCHWARTZ and J. L. GRAY: Contactless nondestructive measurement of bulk and surface recombination using frequency-modulated free carrier absorption 311

M. G. MIER, D. C. LOOK, D. C. WALTERS and D. L. BEASLEY: Infrared transmission topography for whole-wafer gallium arsenide materials characterization 319

M. Y. FRANKEL, J. F. WHITAKER, G. A. MOUROU and J. A. VALDMANIS: Ultrahigh-bandwidth vector network analyzer based on external electro-optic sampling..... 325

H. REISINGER: Minimization of errors in ellipsometric measurements 333

II. MOS/SOI PARAMETER MEASUREMENTS

Invited Papers

STEVEN C. WITCZAK, JOHN S. SUEHLE and MICHAEL GAITAN: An experimental comparison of measurement techniques to extract Si–SiO_2 interface trap density 345

TOSHIKAZU NISHIDA: BiMOS and SMOSC structures for MOS parameter measurement 357

Regular Papers

HUNG-SHENG CHEN and SHENG S. LI: Determination of generation lifetime and interface state density using a pulsed silicon–insulator–silicon capacitor 371

M. KERBER, C. MAZURÉ and U. SCHWALKE: Measurement of the threshold voltage in MOS capacitors by the equilibrium controlled static C–V method..... 379

PLAMEN KOLEV: An improved feedback circuit for constant-capacitance voltage transient measurements 387

III. IC METROLOGY AND MISCELLANEOUS MEASUREMENTS

Invited Papers

TIMOTHY R. CORLE: Submicron metrology in the semiconductor industry 391

HARRY A. SCHAFFT and JOHN S. SUEHLE: The measurement, use and interpretation of the temperature coefficient of resistance of metallizations..... 403

T. M. MOORE: C-Mode acoustic microscopy applied to integrated circuit package inspection 411

J. J. KOPANSKI, J. R. LOWNEY, D. S. MILES, D. B. NOVOTNY and G. P. CARVER: High spatial resolution mapping of resistivity variations in semiconductors..... 423

Regular Papers

R. A. ALLEN and M. W. CRESSWELL: Elimination of effects due to patterning imperfections in electrical test structures for submicrometer feature metrology 435

S. E. FISCHER, J. L. SNARE and P. T. NGUYEN: Profiling the bandgap-adjusted mobility in a bipolar transistor base using the inverse Early effect 443

NUMBER 4

F. J. SCHOLZ and J. W. ROACH: Low-frequency noise as a tool for characterization of near-band impurities in silicon 447

M. H. Juang and H. C. Cheng: Formation of shallow p^+n junctions by implanting BF_2^+ ions into thin cobalt films on silicon substrates 453

G. Halkias, A. Vegiri, G. Pananakakis and A. Christou: Efficient charge control model for pseudomorphic and strained high electron mobility transistors on GaAs and InP substrates 459

Douglas E. Dunn and Carlos A. Paz de Araujo: GAVELS, a velocity–space GaAs transport model—I. Steady-state simulation 467

Douglas E. Dunn: GAVELS, a velocity–space GaAs transport model—II. Velocity overshoot simulation 477

O. Bonnaud, M. Sahnoune, A. Solhi and H. Lhermite: Modeling the base current of an a-Si:H/c-Si heterojunction bipolar transistor 483

S. T. Fu and M. B. Das: Modeling of the source resistance in modulation-doped FETs 489

Wen-Chau Liu and Der-Feng Guo: A new GaAs switching device with double-confinement-collector structure 501

Minghui Gao, Jean-Pierre Colinge, Lode Lauwers, Suhua Wu and Cor Claeys: Twin-MOSFET structure for suppression of kink and parasitic bipolar effects in SOI MOSFETs at room and liquid helium temperatures 505

Q. Chen and M. Willander: Relationship between measured and intrinsic transconductances for FETs with gate conduction 513

D. J. Dumin, J. R. Cooper, K. J. Dickerson and G. A. Brown: The polarity, field and fluence dependence of interface trap generation in thin silicon oxide 515

Meng-Chyi Wu, Chi-Ching Chen and Ching-Ting Lee: Growth and characterization of high-quality GaInAsSb layers on GaSb substrates by liquid-phase epitaxy 523

R. Alcubilla, J. Pons and L. Castañer: Superposition solution for minority carrier current in the emitter of bipolar devices 529

G. S. Virdi, C. M. S. Rauthan, B. C. Pathak, W. S. Khokle, S. K. Gupta and Krishan Lal: On the role of fluorine in BF_2^+ implanted silicon 535

William Liu, Damian Costa and J. S. Harris Jr: Derivation of the emitter–collector transit time of heterojunction bipolar transistors 541

William Liu, Damian Costa and J. S. Harris Jr: A simplified model for the distributed base contact impedance in heterojunction bipolar transistors 547

S. C. Chen, Y. K. Su and C. Z. Lee: Collector–emitter offset voltage in single- and double-base InGaAs(P)/InP heterojunction bipolar transistors 553

Shin-Chi Lee and Ting-Wei Tang: Transport coefficients for a silicon hydrodynamic model extracted from inhomogeneous Monte-Carlo calculations 561

R. Vankemmel, W. Schoenmaker, R. Cartuyvels, K. Appeltans and K. De Meyer: Implementation of heterojunctions into the 2-D finite-element simulator PRISM: some scaling considerations 571

L. L. LIOU, C. I. HUANG and J. EBEL: Numerical studies of thermal effects on heterojunction bipolar transistor current–voltage characteristics using one-dimensional simulation 579

P. CHAKRABARTI, R. ANAND and V. SRINIVASA RAO: I–V Characteristics of an optically controlled Si-MESFET 587

S. R. SHUKLA and M. N. SEN: Analytical expressions for the drift velocity of hot charge carriers in silicon 593

J. WENG: Transit time of fast bipolar transistors at high collector-current densities 599

ANNOUNCEMENT I

SOFTWARE SURVEY SECTION III

NUMBER 5

D. X. XU, G. D. SHEN, M. WILLANDER, F. SCHÄFFLER and J. F. LUY: Experimental studies on the NDR of $Si_{1-x}Ge_x$/Si triple barrier resonant tunneling diodes 611

SHENG-LYANG JANG and KUANG-LANG CHERN: Breakdown characteristics of emitter–base and collector–base junctions of silicon bipolar junction transistors 615

H. C. TSENG and SHENG S. LI: Negative differential conduction (NDC) in n^+–v–p^+–v–n^+ AlGaAs/GaAs heterojunction devices 623

J. B. KUO, C. C. CHANG and T. C. LU: A poly-emitter BJT Gummel–Poon model for pull-up transient analysis of a BiCMOS inverter 629

W. C. HSU and H. M. SHIEH: A δ-doped GaAs/$In_{0.37}Ga_{0.63}As$/GaAs high electron mobility transistor prepared by low-pressure metalorganic chemical vapor deposition 635

S. C. JAIN, J. M. MCGREGOR, D. J. ROULSTON and P. BALK: Modified simple expression for bandgap narrowing in n-type GaAs 639

S. L. CHEN and JENG GONG: Influence of drain bias voltage on determining the effective channel length and series resistance of drain-engineered MOSFETs below saturation .. 643

S. DECOUTERE, L. DEFERM, C. CLAEYS and G. DECLERCK: Modeling the non-uniformity of base sheet resistivity at high currents in bipolar transistors 651

YOUNG HEE BYUN, MICHAEL SHUR, MICHAEL HACK and KWYRO LEE: New analytical polycrystalline-silicon thin-film transistor model for computer aided design and parameter extraction 655

O. VANBESIEN, H. LEROUX and D. LIPPENS: Maximally flat transmission windows in finite superlattices 665

KONSTANTIN NIKOLIĆ: Steady-states in a cooled p-Ge photoconductor via the Landsberg–Schöll–Shukla model 671

MICHAEL REISCH: Self-heating in BJT circuit parameter extraction 677

T. LASKA, G. MILLER and J. NIEDERMEYR: A 2000 V non-punchthrough IGBT with high ruggedness 681

Q. CHEN and M. WILLANDER: Analytical d.c. and small-signal a.c. modeling of Si delta(δ)-doped field effect transistors 687

Y. L. LE COZ and H. F. TIERSTEN: Ehrenfest derivation of forces acting within semiconductors of inhomogeneous material composition 695

P. VAN MIEGHEM, S. DECOUTERE, G. BORGHS and R. MERTENS: Influence of majority carrier bandtails on the performance of semiconductor devices 699

CHING-YUAN WU and CHIOU-FENG CHEN: Physical model for characterizing and simulating a FLOTOX EEPROM device 705

TOMASZ SKOTNICKI, GÉRARD MERCKEL and CHRISTIAN DENAT: Triggering and sustaining of snapback in MOSFETs 717

J. S. WU, C. P. LEE, C. Y. CHANG, K. H. CHANG, D. G. LIU and D. C. LIOU: Intrinsic and extrinsic effects on performance limitation of AlGaAs/GaAs double-barrier resonant tunneling structures 723

M. A. AMATO: Thermal excitation rates and capture cross sections associated with deep impurities in semiconductors 731

A. R. BATCHELOR: On the design of doping concentration profiles for GaAs transferred-electron device layers 735

Notes

A. R. BATCHELOR, R. E. MILES and M. J. HOWES: On the relative advantages of modelling semiconductors using a non-isothermal analysis 743

WILLIAM H. HAYDL: Highly forward-biased FET gates and their experimental current and voltage distributions 747

K. F. KNOTT: Direct observation of intermediate levels in multistep burst noise 749

SOFTWARE SURVEY SECTION I

NUMBER 6

CHUNG-YIH SUN and WEN-CHAU LIU: A new GaAs bipolar transistor with a doping-superlattice collector 751

IBRAHIM M. ABDEL-MOTALEB and C. N. LI: Nonlinear model for MODFET parasitic resistances 759

HONGCHIN LIN, NEIL GOLDSMAN and I. D. MAYERGOYZ: Device modeling by deterministic self-consistent solution of Poisson and Boltzmann transport equations ... 769

H. R. LIAUH, M. F. TSENG, M. C. CHEN and L. J. CHEN: Influence of contact treatments on the electrical characteristics of shallow-junction titanium-based contacts 779

T. C. Lu and J. B. Kuo: An analytical bandgap-narrowing-related current-gain model for BJT devices operating at 77 K 785

Y. Pan, S. C. Jain, M. Kleffstra and P. Balk: Modelling of band tails and their effects on minority carrier transport in heavily doped silicon 791

H. Reisinger, H. Oppolzer and W. Hönlein: Thickness determination of thin SiO_2 on silicon 797

J. J. Liou and J. S. Yuan: Surface recombination current of AlGaAs/GaAs heterojunction bipolar transistors 805

W. Pittroff, H. G. Bach and G. Beister: Numerical modelling of carrier profiles in isotype and anisotype heterojunction devices 815

S. Bellone, G. Cocorullo, F. G. Della Corte, H. L. Hartnagel and G. Schweeger: Analytical model for GaAs pin diodes for a wide range of currents and temperatures 821

D. Misra and V. S. Simhadri: A survey of the potential of an IrSi Schottky barrier MOSFET based on simulation studies 829

Abdulmecit Türüt, Necati Yalçın and Mustafa Sağlam: Parameter extraction from non-ideal C–V characteristics of a Schottky diode with and without interfacial layer.. 835

R. R. Siergiej, M. H. White and N. S. Saks: Theory and measurement of quantization effects on Si–SiO_2 interface trap modeling 843

T. Easwarakhanthan, Z. Ouennoughi and S. Ravelet: An inversion method for the complete characterization of transparent film-absorbing substrate systems using multiple angle ellipsometry 855

Masaaki Tomizawa, Tadao Ishibashi, Herbert S. Bennett and Jeremiah R. Lowney: Effects of heavy doping on numerical simulations of gallium arsenide bipolar transistors 865

Notes

P. Chattopadhyay and B. Raychaudhuri: Origin of the anomalous peak in the forward capacitance–voltage plot of a Schottky barrier diode 875

L. B. Chang, M. S. Huang and S. F. Lai: Monolithic TJS light emitting device grown on SI GaAs substrate by LPE 879

Corrigendum I

Software Survey Section III

NUMBER 7

I. Ahmad and S. Ahmad: Influence of a non-uniformly doped semiconductor region on Skin Effect Resistance of ohmic contacts in mm-wave IMPATTs 883

William Liu and James S. Harris Jr: Parasitic conduction current in the passivation ledge of AlGaAs/GaAs heterojunction bipolar transistors 891

J. G. C. BAKKER, J. BISSCHOP and W. H. A. SCHILDERS: Current–voltage relation for abrupt N^+–P–N^+ and N–i–N structures 897

Q. KIM, H. R. SCHWARTZ, L. D. EDMONDS and J. A. ZOUTENDYK: Diagnosis of NMOS DRAM functional performance as affected by a picosecond dye laser 905

J. RACKO, D. DONOVAL, M. BARUS, V. NAGL and A. GRMANOVA: Revised theory of current transport through the Schottky structure 913

J. S. YUAN: Modeling $Si/Si_{1-x}Ge_x$ heterojunction bipolar transistors 921

PING-CHANG YANG and SHENG S. LI: Measurements of substrate carrier lifetimes in silicon-on-insulator wafers by a contactless dual-beam optical modulation technique .. 927

K. A. NEYTS and P. DE VISSCHERE: How to measure and interpret the conduction current in a.c. thin-film electroluminescent devices 933

G. PITZ, H. L. HARTNAGEL, K. MAUSE, F. FIEDLER and D. BRIGGMANN: Fully self-aligned N–p–n InGaAs/InP HBTs with evaluation of their microwave characteristics 937

R. ANGELUCCI, S. SOLMI, A. ARMIGLIATO, E. GABILLI, D. GOVONI, M. MERLI and A. POGGI: Arsenic ion implantation through Mo and Mo silicide layers for shallow junction formation 941

HUYNH VAN CONG and BUI DOAN-KHANH: Simple accurate general expression of the Fermi–Dirac integral $F_j(a)$ for arbitrary a and $j > -1$ 949

D. B. M. KLAASSEN: A unified mobility model for device simulation—I. Model equations and concentration dependence 953

D. B. M. KLAASSEN: A unified mobility model for device simulation—II. Temperature dependence of carrier mobility and lifetime 961

M. H. JUANG and H. C. CHENG: Novel effects of heating rate on the activation/recrystallization of boron-implanted Si substrates 969

A. ČENYS, G. LASIENE and K. PYRAGAS: Spatiotemporal chaos in Gunn diodes in presence of impact ionization 975

P. VITANOV, T. DIMITROVA, R. KAMBUROVA and K. FILLJOV: Capacitance method for determination of LDD MOSFET geometrical parameters 985

S. S. KUCHERENKO and N. A. KUDRYASHOV: Photoelectric characteristics of a semiconductor diode with an abrupt junction at high photoexcitation levels 993

J. POPP and J. WENG: Measurement of transport parameters in heavily-doped emitters of bipolar transistors 999

Y. L. LE COZ and R. B. IVERSON: A stochastic algorithm for high speed capacitance extraction in integrated circuits 1005

J. SZATKOWSKI and K. SIERAŃSKI: Simple interface-layer model for the nonideal characteristics of the Schottky-barrier diode 1013

Notes

MINCHANG LIANG and MARK E. LAW: Influence of a selectively ion-implanted collector on bipolar transistor electrical characteristics 1017

DAVID J. ROULSTON and JOEL M. MCGREGOR: Effect of bandgap gradient in the base region of SiGe heterojunction bipolar transistors 1019

J. S. HAMEL, D. J. ROULSTON and C. R. SELVAKUMAR: Experimental method for extraction of emitter injection limited gain in bipolar transistors 1021

P. CHATTOPADHYAY and B. RAYCHAUDHURI: New technique for the determination of series resistance of Schottky barrier diodes 1023

F. FASTOW: Contact resistance and $1/f$ noise of Sn/In/HgCdTe contacts 1025

B. K. SINGH, T. ACHARJEE, A. N. DAW and R. N. MITTRA: Properties of amorphous Bi_2S_3-crystalline silicon heterojunctions 1027

SOFTWARE SURVEY SECTION I

NUMBER 8

P. C. YANG, H. S. CHEN and SHENG S. LI: Measurements of interface state density in partially- and fully-depleted silicon-on-insulator MOSFETs by a high–low-frequency transconductance method 1031

J. CHEN, G. B. GAO and H. MORKOÇ: Comparative analysis of the high-frequency performance of $Si/Si_{1-x}Ge_x$ heterojunction bipolar and Si bipolar transistors 1037

BRUNO BACCUS: Impact of low-temperature transient-enhanced diffusion of dopants in silicon 1045

WILLIAM LIU and JAMES S. HARRIS: Current dependence of base–collector capacitance of bipolar transistors 1051

X. M. LI and M. J. DEEN: Determination of interface state density in MOSFETs using the spatial profiling charge pumping technique 1059

A. CRUZ SERRA, H. ABREU SANTOS, A. MARTY, J. BAILBÉ and G. REY: Evidence of Γ–Γ and X–X coupling using a single abrupt isotype n-GaAs/$Al_{0.5}Ga_{0.5}As$ heterojunction 1065

S. C. JAIN, T. J. GOSLING, J. R. WILLIS, R. BULLOUGH and P. BALK: Theoretical comparison of the stability characteristics of capped and uncapped Ge_xSi_{1-x} strained epilayers 1073

L. P. CHEN, J. J. LOU, T. H. LIU, Y. M. PANG and S. J. YANG: Evaluation of low dark current InSb photovoltaic detectors 1081

D. FLANDRE and A. TERAO: Extended theoretical analysis of the steady-state linear behaviour of accumulation-mode, long-channel p-MOSFETs on SOI substrates 1085

JEFFERY C. HUANG and IBRAHIM M. ABDEL-MOTALEB: Large-signal nonquasi-static model for single and double heterojunction bipolar transistors 1093

DOMINIQUE VUILLAUME and BRIAN S. DOYLE: Properties of hot carrier induced traps in MOSFETs characterized by the floating-gate technique 1099

ANTONIO G. M. STROLLO and GIANFRANCO VITALE: A closed-form two-dimensional model of a laser grooved solar cell 1109

NICCOLO' RINALDI, ANTONIO G. M. STROLLO and PAOLO SPIRITO: Two-dimensional modeling of current gain in downscaled bipolar transistors 1119

ROBERTO SUNG and MUKUNDA B. DAS: Photo-induced current measurement for the characterization of deep-level traps in lattice-matched MODFETs on InP substrate 1129

K. SADRA and B. G. STREETMAN: The coupled hole–phonon system and minority-electron transport in p-GaAs 1139

M. D. J. BOWYER, D. G. ASHWORTH and R. OVEN: Representation of ion implantation projected range profiles by Pearson distribution curves for silicon technology 1151

K. F. KNOTT: Study of sudden changes of large amplitude burst noise in bipolar transistors 1167

K. F. KNOTT: Statistical analysis of transients involved in moderate amplitude burst noise in bipolar junction transistors 1173

N. B. LUKYANCHIKOVA, N. P. GARBAR and M. V. PETRICHUK: Excess white noise in bipolar junction transistors 1179

D. TRIPATHI, P. C. SRIVASTAVA and S. CHANDRA: Studies on hydrogenated Pd/p-type Si diodes 1185

Notes

C. PAPADAS, G. GHIBAUDO, G. PANANAKAKIS, C. GOUNELLE, P. MORTINI and C. RIVA: Influence of tunnel oxide thickness variation on the programmed window of FLOTOX EEPROM cells 1195

K. GMUCOVÁ: Investigation of the background in the spectrum of an MOS structure obtained by correlated DLTS 1197

CORRIGENDA 1201

SOFTWARE SURVEY SECTION: Sspice and TOPSIM I

NUMBER 9

J. B. KUANG, S. RATANAPHANYARAT, S. F. CHU and K. SESHAN: Self-aligned vertical p–n–p transistor: device characterization from room to cryogenic temperatures 1203

ZEYNEP ÇELIK-BUTLER and MIN YE: Prediction of electromigration failure in W/Al–Cu multilayered metallizations by $1/f$ noise measurements 1209

SZE-HIM NG and CHARLES SURYA: Studies of flicker noise in $In_{0.53}Ga_{0.47}As$/AlAs/InAs resonant tunneling diodes 1213

BING-YUE TSUI and MAO-CHIEH CHEN: Contact resistivity of shallow junctions formed by implantation through Pt or PtSi 1217

MATS ROSLING, HENRY BLEICHNER, MÅNS LUNDQVIST and EDVARD NORDLANDER: A novel technique for the simultaneous measurement of ambipolar carrier lifetime and diffusion coefficient in silicon 1223

J. OLSSON, H. NORDE and U. MAGNUSSON: Investigation of the current–voltage behavior of a combined Schottky–p–n diode 1229

HUNG-SHENG CHEN and SHENG S. LI: Comparison of statistical variation of threshold voltage in bulk and SOI MOSFETs 1233

SHINICHI TAKIGAWA, KEN BACHER, LEWIS B. ARONSON and JAMES S. HARRIS JR: Design and performance of a low-threshold-current grating-coupled surface-emitting laser 1241

V. W. L. CHIN, T. OSOTCHAN and T. L. TANSLEY: On the calculation of electron mobility in $In_{0.53}Ga_{0.47}As$ 1247

Y. PAN: Electrical characterization of hole transport in heavily-doped shallow implanted emitters 1253

M. B. ŽIVANOV and M. M. JEVTIĆ: Majority carrier mobility in highly-doped n-type Si 1261

N. G. PATEL and P. G. PATEL: Thermoelectric cooling effect in a p-Sb_2Te_3–n-Bi_2Te_3 thin film thermocouple 1269

O. ROUX DIT BUISSON, G. GHIBAUDO and J. BRINI: Model for drain current RTS amplitude in small-area MOS transistors 1273

HAE-SEOK CHO and JERRY G. FOSSUM: Polysilicon emitter design for scaled BiCMOS circuits 1277

B. K. JONES and G. P. TAYLOR: Spectroscopy of surface states using the excess noise in a buried-channel MOS transistor 1285

A. ORTIZ-CONDE, R. HERRERA, P. E. SCHMIDT, F. J. GARCÍA SÁNCHEZ and J. ANDRIAN: Long-channel silicon-on-insulator MOSFET theory 1291

ANATOLY A. GRINBERG and SERGE LURYI: Diffusion in a short base 1299

SHIH-CHIH CHEN, YAN-KUIN SU and CHUN-ZEN LEE: A study of current transport in p–N heterojunctions 1311

JICHENG ZHOU, QIANBAO ZHAN, ZHIPING FU, DONGLIANG LÜ, LIMIN GUAN and HUANGQI CHEN: Behavior of types A and B hole traps in n-type GaAs during long-period operation 1325

S. J. CHUA and S. H. LEE: Contact resistivity measurement using four circular contacts 1331

F. COROMINA, A. PÉREZ-RODRÍGUEZ, J. R. MORANTE, J. MACÍA, M. A. LOURENÇO, K. P. HOMEWOOD and P. L. F. HEMMENT: Effects of electric field on photoconductive frequency resolved spectroscopy: analysis of silicon-on-insulator structures 1337

HILMI ÜNLÜ: A thermodynamic model for determining pressure and temperature effects on the bandgap energies and other properties of some semiconductors 1343

A. Ph. Akulov, V. V. Aphanasjev and V. A. Gurtov: Determination of the radiation-induced charge centroid in a MIS dielectric 1353

A. V. Gorbatyuk and P. B. Rodin: Effect of distributed-gate control on current filamentation in thyristors 1359

X. B. Chen, B. Zhang and Z. J. Li: Theory of optimum design of reverse-biased p–n junctions using resistive field plates and variation lateral doping 1365

Notes

T. C. Lu and J. B. Kuo: An analytical bandgap-narrowing-related current-gain model including concentration dependent diffusion coefficients for VLSI BJT devices 1371

T. C. Lu and J. B. Kuo: A closed-form analytical BJT forward transit time model considering bandgap-narrowing effects and concentration-dependent diffusion coefficients 1374

J. J. Liou: Effect of base grading on the Early voltage of HBTs 1378

G. Sh. Gildenblat: Analytic d.c. characteristic of space-charge-limited currents with field-dependent mobility 1381

Letter to the Editors

J. M. McGregor, T. Manku and D. J. Roulston: Retraction: bipolar transistor base bandgap grading for minimum delay 1383

Announcement I

Software Survey Section III

NUMBER 10

C. H. Su, Y. K. Su and F. S. Juang: GaSb/InGaSb strained-layer quantum wells by MOCVD 1385

S. Noor Mohammad: Unified model for drift velocities of electrons and holes in semiconductors as a function of temperature and electric field 1391

G. A. M. Hurkx: An improved analytical description of the effect of velocity saturation on the collector current of a bipolar transistor 1397

H. Thomas and J. K. Luo: Effect of plasma pre-treatment on Au/p-InP Schottky diodes 1401

Kai C. Yung, Karna J. Wahlstrand, Jick H. Yee and Ray P. Mariella Jr: Theoretical investigation of the lasing characteristics of several GRIN–SCH quantum well lasers 1409

R. K. Chanana, R. Dwivedi and S. K. Srivastava: Silicon wafer cleaning with CF_4/H_2 plasma and its effect on the properties of dry thermally grown oxide 1417

Abdülmecit Türüt, Sebahattin Tüzemen, Muhammet Yildirim, Bahattin Abay and Mustafa Sağlam: Barrier height enhancement by annealing Cr–Ni–Co alloy Schottky contacts on LEC GaAs 1423

Z. Q. Shi and W. A. Anderson: Cryogenic processing of metal/GaAs Schottky diodes 1427

Z. J. MA, P. T. LAI and Y. C. CHENG: Electrical characterization and simulation of substrate current in *n*-MOSFETs with nitrided/reoxidized-nitrided oxides as gate dielectrics 1433

M. AHMAD and B. M. ARORA: Investigation of AuGeNi contacts using rectangular and circular transmission line model 1441

G. SANCHEZ, J. GARRIDO, J. MARTINEZ, J. PIQUERAS, E. LORA and C. DOMINGUEZ: Electrical characteristics of aligned and transversally recrystallized SOI-MOS transistors 1447

E. PŁACZEK-POPKO and L. SZARO: Surface photovoltage in CdMnTe 1451

E. SIMOEN and B. DIERICKX: Kink-related low-frequency noise overshoot in Si NMOSTs at liquid helium temperatures 1455

S. LIANG, L. Z. HOU, T. GU and C. A. T. SALAMA: Latch-up modeling of BiCMOS merged bipolar–MOS structures 1461

XIAOSONG LI and L. K. J. VANDAMME: $1/f$ Noise in series resistance of LDD MOSTs .. 1471

XIAOSONG LI and L. K. J. VANDAMME: $1/f$ Noise in MOSFET as a diagnostic tool 1477

ACHYUT KUMAR DUTTA, NARIHIRO MOROSAWA and YOSHINORI HATANAKA: Characteristics of a single a-SiC:H/a-Si:H heterostructure as a high-gain photodetector 1483

S. LUCHERINI: A high-threshold low-capacitance MOSFET 1489

Q. CHEN, M. WILLANDER, P. NAROZNY and H. DÄMBKES: Subthreshold current in submicron AlGaAs/GaAs MODFETs 1493

XIUMIAO ZHANG: Description of non-equilibrium phenomena in MIS device under linear voltage ramp bias 1497

H. BHIMNATHWALA and J. M. BORREGO: Surface characterization of LEC SI–GaAs using photoreflectance with sub-bandgap excitation 1503

MING-BING CHANG, UMESH SHARMA and SHIH K. CHENG: An improved model for the erase operation of a FLOTOX EEPROM cell 1513

MING-BING CHANG, KO-MIN CHANG, CLINTON KUO and SHIH K. CHENG: A new scalable floating-gate EEPROM cell 1521

M. H. JUANG and H. C. CHENG: Formation of self-aligned $TiSi_2$ p^+–n junctions by implanting BF_2^+ ions through thin Ti or SiO_2 film on Si substrate rapid thermal annealing 1529

M. H. JUANG and H. C. CHENG: Characterization of silicided shallow n^+p junctions formed by P^+ implantation into thin Ti films on Si substrates 1535

T. ZIMMER, D. OURO BODI, J. M. DUMAS, N. LABAT, A. TOUBOUL and Y. DANTO: Kink effect in HEMT structures: a trap-related semi-quantitative model and an empirical approach for SPICE simulation 1543

A. L. ALEXANDROV, M. S. OBRECHT and G. V. GADIYAK: Efficient method for numerical modeling of thermal redistribution of interacting impurities under oxidizing ambient 1549

Notes

J. B. KUO, W. C. LEE and J. H. SIM: Back gate bias effects on the pull-down transient behavior in an ultra-thin SOI CMOS inverter operating at 300 and 77 K 1553

C. C. CHANG, T. C. LU and J. B. KUO: A closed-form analytical poly-emitter BJT forward transit time model considering bandgap-narrowing effects and concentration-dependent diffusion coefficients for poly-emitter BJT devices 1556

YEN C. TZENG, PING C. YANG, CHING S. LEE and SHENG S. LI: Characterization of generation lifetime and deep-level defects in an $In_{0.4}Ga_{0.6}As$ p–i–n photodiode prepared by molecular beam epitaxy growth on GaAs 1561

S. S. DE, A. K. GHOSH, T. K. PATTANAYAK, A. K. HAZRA and J. C. HALDAR: Studies on open-circuit photovoltage in heavily doped abrupt P–N junction 1564

ANNOUNCEMENT I

SOFTWARE SURVEY SECTION III

NUMBER 11

WILLIAM LIU: Effective lateral diffusion length in *Npn* AlGaAs/GaAs heterojunction bipolar transistors 1567

WILLIAM LIU: Theoretical comparison of donor-density graded base and uniformly doped base in *Pnp* AlGaAs/GaAs heterojunction bipolar transistors 1573

TIEN SHENG CHAO, CHUNG LEN LEE and TAN FU LEI: A study of the interfacial layer of Al and Al(1% Si)–Si contacts using a zero-layer ellipsometry model 1579

A. SCHENK: A model for the field and temperature dependence of Shockley–Read–Hall lifetimes in silicon 1585

TAHUI WANG, TING-HUA HSIEH and YI-TEH CHEN: Quantum well geometrical effects on two-dimensional electron mobility 1597

C. BACKHOUSE and L. YOUNG: Deep level domain spectroscopy of low frequency oscillations in semi-insulating InP 1601

A. SOLHI, M. SAHNOUNE, H. LHERMITE and O. BONNAUD: Numerical simulation and experimental verification of the parameters determining the base current in an a-Si : H/c-Si emitter-base heterojunction bipolar transistor 1609

J. KASSABOV, E. ATANASSOVA, J. VASSILEVA and D. DIMITROV: Influence of u.v. radiation and source-to-bulk bias on the processes in the Si–SiO_2 inversion channel 1621

J. OSVALD: On barrier height inhomogeneities at polycrystalline metal–semiconductor contacts 1629

A. ST. DENIS, D. L. PULFREY and A. MARTY: Reciprocity in heterojunction bipolar transistors 1633

KO-MING SHIH, D. P. KLEMER and J. J. LIOU: Current–voltage characteristics of submicrom GaAs MESFETs with nonuniform channel doping profiles 1639

B. P. Rai, R. Dwivedi and S. K. Srivastava: Negative bias instability in silicon dioxide films grown using oxidise–etch–oxidise process 1645

T. Smedes and J. A. van Steenwijk: A new description of dual γ-factor threshold voltage with continuous second-order derivative 1649

J. H. Sim and J. B. Kuo: A back-gate bias effect model considering the charge accumulation behavior above the field oxide for ultra-thin SOI NMOS devices 1655

Xiumiao Zhang: Investigation of N^+–P diffused junction silicon solar cells 1661

Swapan K. Datta, K. Mukhopadhyay, S. Bandopadhyay and H. Saha: An improved technique for the determination of solar cell parameters 1667

S. R. Dhariwal and R. C. Sharma: Ramp recovery in p–i–n diodes: general mathematical formulation and comparison with other methods of lifetime measurement 1675

H. Bleichner, M. Bakowski, M. Rosling, E. Nordlander, J. Vobecky, M. Lundqvist and S. Berg: A study of turn-off limitations and failure mechanisms of GTO thyristors by means of 2-D time-resolved optical measurements 1683

Jiang Zheng, Jing Wu and Tongli Wei: Design and analysis of silicon bipolar transistors for low temperature operation 1697

Software Survey Section I

NUMBER 12

Patrick J. McNally: The use of generalised models to explain the behaviour of Ohmic contacts to n-type GaAs 1705

Heng-Chih Lin, Wen-Jyh Sah and Si-Chen Lee: A common-gate CMOS inverter with n-channel amorphous silicon thin-film transistor formed on a crystalline PMOSFET 1709

M. A. Abdala and B. K. Jones: Correlation between trap characterisation by low frequency noise, mutual conductance dispersion, oscillations and DLTS in GaAs MESFETs 1713

S. K. Lahiri, A. DasGupta, I. Manna and M. K. Das: A quasi-3D analytical threshold voltage model of small geometry MOSFETs 1721

J. A. Jimenez-Tejada, J. A. Lopez-Villanueva, P. Cartujo and J. E. Carceller: A non-destructive method to determine impurity-profiles in non-abrupt p–n junctions with deep levels 1729

I. Thurzo, D. Pogány and K. Gmucová: A novel algorithm for higher order filtering in DLTS 1737

Qin Lu, P. Ratnam and C. Andre T. Salama: Novel high-voltage Silicon-On-Insulator MOSFETs 1745

Xiumiao Zhang: Theory of field enhanced non-equilibrium transients in MIS devices under a linear voltage sweep 1751

A. B. Joshi and D. L. Kwong: Comparison of *n*-MOSFET lifetime estimates based on GIDL enhancement and transconductance degradation as criteria 1757

G. A. Armstrong and W. D. French: Simulation of ultra thin film SOI transistors using a non-local ballistic model for impact ionisation 1761

C. W. Wang and C. H. Wu: A novel technique of analyzing multiexponential transients for DLTS spectra 1771

Haosheng Zhou and D. L. Pulfrey: A new method for estimating the electron concentration in the 2-dimensional electron gas in MODFETs 1779

F. Balestra: Analysis of the dependence of the subthreshold swing and the threshold voltage on the substrate voltage of thin-film SOI MOSFETs. Extraction of the interface state densities 1783

Sheng-Lyang Jang, Fong-Chin Liu and Jim-Yat Wu: Current reversals in *p–n–p* transistors 1787

M. Shur, T. A. Fjeldly, T. Ytterdal and K. Lee: Unified MOSFET model 1795

Sze-Him Ng and Charles Surya: A model for low frequency excess noise in Si-JFETs at low bias 1803

C.-Y. Su and H.-L. Hwang: Simulation and analysis of amorphous silicon image sensor having a *p–i–n* structure 1811

Narain D. Arora, David A. Bell and Larry A. Bair: An accurate method of determining MOSFET gate overlap capacitance 1817

B. R. Nag, G. Ghosh and S. Dhar: A simple microwave method for monitoring the conductivity of semiconductor epitaxial layers 1823

V. B. Orlov: Conductance fluctuations in solids caused by defect migration 1827

Notes

J. Grňo and R. Janota: Approximation of the Gaussian implanted profile by a rectangular profile 1833

B. Paldus and D. J. Roulston: Optimum emitter parameters for maximum gain in uniformly doped *NPN* and *PNP* bipolar transistors 1836

K. M. Rahman and M. R. Kahn: Interference type amplifier using intermodal interference in potential channel structures 1841

Reza Rofan, Jack Churchill, Chenming Hu and Yupin Fong: Elimination of stress induced oxide leakage in textured tunneling oxide 1843

Software Survey Section I